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Towards standardisation of the longline CPUE series from the lobster fisheries around Inaccessible, Nightingale and Gough islands

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Introduction

Two CPUE indices exist for the tristan lobster (*Jasus tristani*) fisheries surrounding Inaccessible, Nightingale and Gough islands. Here the nominal indices are presented, alongside descriptions of how they will be standardised to ensure they each provide a more accurate index of population density.

Available data

Logsheet data from the fisheries around each island are available by Season-Year, where one Season-Year is taken to run from May until April the following year (by convention, reference to Season-Year 2005 for example, refers to the period from May 2005 to April 2006). Unless otherwise specified a "year" refers to a Season-Year. These data have been cleaned of all large (> 20 kg/min) outlying CPUE values.

Summary sheets recorded by the Agriculture and Natural Resources Department on Tristan da Cunha are also available. These contain summary data (total catch and total effort) from the logsheets, although because some logsheets are missing (Edwards and Glass, 2007) and logsheets only record the approximate catch prior to processing, summary sheets are considered a more accurate record. Summary sheet catches are recorded in units of packed weight and have

therefore been scaled upwards by approximately 2% to account for weight lost during processing and overpacking (Edwards, 2007).

Historical data are available from Sea Fisheries, South Africa (now Marine and Coastal Management) and consist of the total catch and total effort for each year.

A detailed description of these data sources is given in Edwards (2007). The dates covered by each are listed below.

	Inaccessible	Nightingale	Gough
Historical	1970-1993	1970-1993	1970-1993
Summary sheets	1996-2006	1996-2006	1997-2006
Logsheets	1996-2005	2000-2005	1999-2005

In this report historical data and summary sheet data are jointly referred to as Summary data.

Outline of standardisation

Summary data

The CPUE is estimated as total longline catch divided by total longline effort for each year. However different traps have been used in the fishery. Between 1970 and 1973 only Plastic traps were used. Since 1974 Monster traps have predominated, although Beehive traps were used intermittently between 1996 and 2000. It should be noted that the Summary data does not distinguish between the catch and effort for each trap type.

Because different traps are likely to have different catch rates, standardisation will require inter-calibration of these catch rates using a General Linear Model (GLM - which can also take account of other potential explanatory variables as indicated below) applied to the logsheet data. GLM estimates of the relative catch rates for different trap types will then be used to adjust total effort records so that effort for all years is measured in units of total Monster traps hauled.

Logsheets data

The CPUE is estimated as the average catch divided by effort across all records for a particular year. However longline catch records are inaccurate (Edwards, 2007) and it will therefore be necessary to adjust individual logsheet catches so that the total for each year equals the total catch recorded in the Summary data (note that this adjustment must also be scaled using effort information to

account for missing Logsheet data). A GLM will then need to be applied to standardise for the influence on catch rate of factors such as month, area, trap type, depth and soak time.

Tables

Catch, effort and nominal CPUE, broken down by trap type and given for both the Summary and Logsheet data, are listed in Tables 1 to 9.

Conclusion

This document presents the nominal CPUE series for Inaccessible, Nightingale and Gough islands, derived from the Summary and Logsheet data. The standardisation procedures have also been outlined briefly and will be presented in their completed form in subsequent documents.

References

- Edwards, C. T. T. (2007). Sources of data from the lobster fisheries on Inaccessible, Nightingale, Gough and Tristan da Cunha. Technical Report MARAM/Tristan/07/Dec/05, Ovenstone Fisheries.
- Edwards, C. T. T. and Glass, J. P. (2007). Reconciliation of data from the lobster fisheries on Inaccessible, Nightingale and Gough islands. Technical Report MARAM/Tristan/07/Dec/06, Ovenstone Fisheries.

Table 1: Longline catch in kilograms: **Inaccessible** island (*Summary data does not distinguish between the catch and effort for each trap type)

Season	Summary				Logsheet			
Year	Monster	Beehive	Plastic	Total	Monster	Beehive	Plastic	Total
1970	0	0	80000	80000				
1971	0	0	147000	147000				
1972	0	0	116000	116000				
1973	0	0	214000	214000				
1974	282000	0	0	282000				
1975	133000	0	0	133000				
1976	224000	0	0	224000				
1977	138000	0	0	138000				
1978	123000	0	0	123000				
1979	141000	0	0	141000				
1980	34000	0	0	34000				
1981	102000	0	0	102000				
1982	78000	0	0	78000				
1983	50000	0	0	50000				
1984	38000	0	0	38000				
1985	50000	0	0	50000				
1986	36000	0	0	36000				
1987	49000	0	0	49000				
1988	39000	0	0	39000				
1989	39000	0	0	39000				
1990	52000	0	0	52000				
1991	35000	0	0	35000				
1992	50000	0	0	50000				
1993	46000	0	0	46000				
1994								
1995								
1996	11226*	0	0	11226	0	0	31503	31503
1997	44609*	0	0	44609	15857	33037	0	48894
1998	37982*	0	0	37982	33297	4908	0	38205
1999	42667	0	0	42667	26913	0	0	26913
2000	39719	0	0	39719	43592	0	0	43592
2001	51231*	0	0	51231	50946	0	74	51020
2002	52215	0	0	52215	52548	0	0	52548
2003	37508	0	0	37508	41911	0	0	41911
2004	76753	0	0	76753	81489	0	0	81489
2005	93126	0	0	93126	88575	0	0	88575
2006	83007	0	0	83007				

Table 2: Longline effort in number of traps hauled: **Inaccessible** island (*Summary data does not distinguish between the catch and effort for each trap type)

Season	Summary				Logsheet			
Year	Monster	Beehive	Plastic	Total	Monster	Beehive	Plastic	Total
1970	0	0	19800	19800				
1971	0	0	38300	38300				
1972	0	0	43900	43900				
1973	0	0	32600	32600				
1974	28100	0	0	28100				
1975	14000	0	0	14000				
1976	23700	0	0	23700				
1977	31000	0	0	31000				
1978	23600	0	0	23600				
1979	17400	0	0	17400				
1980	10400	0	0	10400				
1981	21700	0	0	21700				
1982	16700	0	0	16700				
1983	13500	0	0	13500				
1984	15400	0	0	15400				
1985	19400	0	0	19400				
1986	16800	0	0	16800				
1987	19000	0	0	19000				
1988	20300	0	0	20300				
1989	19700	0	0	19700				
1990	20300	0	0	20300				
1991	14300	0	0	14300				
1992	18200	0	0	18200				
1993	26600	0	0	26600				
1994								
1995								
1996	21604*	0	0	21604	0	0	17472	17472
1997	40814*	0	0	40814	4712	35661	0	40373
1998	16994*	0	0	16994	13233	3600	0	16833
1999	15008	0	0	15008	7350	0	0	7350
2000	13674	0	0	13674	13374	0	0	13374
2001	15358*	0	0	15358	15235	0	107	15342
2002	11098	0	0	11098	12049	0	0	12049
2003	6697	0	0	6697	6613	0	0	6613
2004	11479	0	0	11479	11299	0	0	11299
2005	13162	0	0	13162	12972	0	0	12972
2006	9601	0	0	9601				

Table 3: Nominal longline CPUE in kg per trap hauled: **Inaccessible** island
 (*Summary data does not distinguish between the catch and effort for each trap type)

Season	Summary				Logsheet			
Year	Monster	Beehive	Plastic	Total	Monster	Beehive	Plastic	Total
1970	0.00	0.00	4.04	4.04				
1971	0.00	0.00	3.84	3.84				
1972	0.00	0.00	2.64	2.64				
1973	0.00	0.00	6.56	6.56				
1974	10.04	0.00	0.00	10.04				
1975	9.50	0.00	0.00	9.50				
1976	9.45	0.00	0.00	9.45				
1977	4.45	0.00	0.00	4.45				
1978	5.21	0.00	0.00	5.21				
1979	8.10	0.00	0.00	8.10				
1980	3.27	0.00	0.00	3.27				
1981	4.70	0.00	0.00	4.70				
1982	4.67	0.00	0.00	4.67				
1983	3.70	0.00	0.00	3.70				
1984	2.47	0.00	0.00	2.47				
1985	2.58	0.00	0.00	2.58				
1986	2.14	0.00	0.00	2.14				
1987	2.58	0.00	0.00	2.58				
1988	1.92	0.00	0.00	1.92				
1989	1.98	0.00	0.00	1.98				
1990	2.56	0.00	0.00	2.56				
1991	2.45	0.00	0.00	2.45				
1992	2.75	0.00	0.00	2.75				
1993	1.73	0.00	0.00	1.73				
1994								
1995								
1996	0.52*	0.00	0.00	0.52	0.00	0.00	1.82	1.82
1997	1.09*	0.00	0.00	1.09	3.37	0.93	0.00	1.82
1998	2.24*	0.00	0.00	2.24	2.52	1.36	0.00	2.41
1999	2.84	0.00	0.00	2.84	3.66	0.00	0.00	3.66
2000	2.90	0.00	0.00	2.90	3.23	0.00	0.00	3.23
2001	3.34*	0.00	0.00	3.34	3.32	0.00	0.49	3.31
2002	4.70	0.00	0.00	4.70	4.35	0.00	0.00	4.35
2003	5.60	0.00	0.00	5.60	6.34	0.00	0.00	6.34
2004	6.69	0.00	0.00	6.69	7.16	0.00	0.00	7.16
2005	7.08	0.00	0.00	7.08	6.82	0.00	0.00	6.82
2006	8.65	0.00	0.00	8.65				

Table 4: Longline catch in kilograms: **Nightingale** island

Season	Summary				Logsheet			
Year	Monster	Beehive	Plastic	Total	Monster	Beehive	Plastic	Total
1970	0	0	141000	141000				
1971	0	0	98000	98000				
1972	0	0	49000	49000				
1973	0	0	77000	77000				
1974	166000	0	0	166000				
1975	245000	0	0	245000				
1976	182000	0	0	182000				
1977	71000	0	0	71000				
1978	34000	0	0	34000				
1979	114000	0	0	114000				
1980	97000	0	0	97000				
1981	55000	0	0	55000				
1982	61000	0	0	61000				
1983	34000	0	0	34000				
1984	40000	0	0	40000				
1985	50000	0	0	50000				
1986	60000	0	0	60000				
1987	45000	0	0	45000				
1988	55000	0	0	55000				
1989	27000	0	0	27000				
1990	36000	0	0	36000				
1991	51000	0	0	51000				
1992	42000	0	0	42000				
1993	40000	0	0	40000				
1994								
1995								
1996	15573	0	0	15573				
1997	32943	0	0	32943				
1998	36789	0	0	36789				
1999	35261	0	0	35261				
2000	30514	0	0	30514	17955	0	0	17955
2001	40175	0	0	40175	41247	0	0	41247
2002	34777	0	0	34777	35876	0	0	35876
2003	32847	0	0	32847	28207	0	0	28207
2004	62088	0	0	62088	32025	0	0	32025
2005	59806	0	0	59806	59660	0	0	59660
2006	54236	0	0	54236				

Table 5: Longline effort in number of traps hauled: **Nightingale** island

Season	Summary				Logsheet			
Year	Monster	Beehive	Plastic	Total	Monster	Beehive	Plastic	Total
1970	0	0	24300	24300				
1971	0	0	23700	23700				
1972	0	0	13200	13200				
1973	0	0	12900	12900				
1974	13100	0	0	13100				
1975	28700	0	0	28700				
1976	22400	0	0	22400				
1977	11000	0	0	11000				
1978	5900	0	0	5900				
1979	17600	0	0	17600				
1980	18500	0	0	18500				
1981	14100	0	0	14100				
1982	13600	0	0	13600				
1983	8900	0	0	8900				
1984	12300	0	0	12300				
1985	13600	0	0	13600				
1986	18600	0	0	18600				
1987	16600	0	0	16600				
1988	19600	0	0	19600				
1989	11700	0	0	11700				
1990	12600	0	0	12600				
1991	17100	0	0	17100				
1992	13300	0	0	13300				
1993	17500	0	0	17500				
1994								
1995								
1996	7465	0	0	7465				
1997	26316	0	0	26316				
1998	13455	0	0	13455				
1999	12685	0	0	12685				
2000	7514	0	0	7514	4000	0	0	4000
2001	12900	0	0	12900	12826	0	0	12826
2002	10772	0	0	10772	10750	0	0	10750
2003	5525	0	0	5525	5049	0	0	5049
2004	10641	0	0	10641	5433	0	0	5433
2005	8264	0	0	8264	8264	0	0	8264
2006	6514	0	0	6514				

Table 6: Nominal longline CPUE in kg per trap hauled: **Nightingale** island

Season	Summary				Logsheet			
Year	Monster	Beehive	Plastic	Total	Monster	Beehive	Plastic	Total
1970	0.00	0.00	5.80	5.80				
1971	0.00	0.00	4.14	4.14				
1972	0.00	0.00	3.71	3.71				
1973	0.00	0.00	5.97	5.97				
1974	12.67	0.00	0.00	12.67				
1975	8.54	0.00	0.00	8.54				
1976	8.13	0.00	0.00	8.13				
1977	6.45	0.00	0.00	6.45				
1978	5.76	0.00	0.00	5.76				
1979	6.48	0.00	0.00	6.48				
1980	5.24	0.00	0.00	5.24				
1981	3.90	0.00	0.00	3.90				
1982	4.49	0.00	0.00	4.49				
1983	3.82	0.00	0.00	3.82				
1984	3.25	0.00	0.00	3.25				
1985	3.68	0.00	0.00	3.68				
1986	3.23	0.00	0.00	3.23				
1987	2.71	0.00	0.00	2.71				
1988	2.81	0.00	0.00	2.81				
1989	2.31	0.00	0.00	2.31				
1990	2.86	0.00	0.00	2.86				
1991	2.98	0.00	0.00	2.98				
1992	3.16	0.00	0.00	3.16				
1993	2.29	0.00	0.00	2.29				
1994								
1995								
1996	2.09	0.00	0.00	2.09				
1997	1.25	0.00	0.00	1.25				
1998	2.73	0.00	0.00	2.73				
1999	2.78	0.00	0.00	2.78				
2000	4.06	0.00	0.00	4.06	4.47	0.00	0.00	4.47
2001	3.11	0.00	0.00	3.11	3.19	0.00	0.00	3.19
2002	3.23	0.00	0.00	3.23	3.33	0.00	0.00	3.33
2003	5.95	0.00	0.00	5.95	5.75	0.00	0.00	5.75
2004	5.83	0.00	0.00	5.83	5.89	0.00	0.00	5.89
2005	7.24	0.00	0.00	7.24	7.22	0.00	0.00	7.22
2006	8.33	0.00	0.00	8.33				

Table 7: Longline catch in kilograms: **Gough** island

Season	Summary				Logsheet			
Year	Monster	Beehive	Plastic	Total	Monster	Beehive	Plastic	Total
1970	0	0	123000	123000				
1971	0	0	380000	380000				
1972	0	0	190000	190000				
1973	0	0	161000	161000				
1974	182000	0	0	182000				
1975	283000	0	0	283000				
1976	64000	0	0	64000				
1977	130000	0	0	130000				
1978	110000	0	0	110000				
1979	60000	0	0	60000				
1980	106000	0	0	106000				
1981	117000	0	0	117000				
1982	85000	0	0	85000				
1983	100000	0	0	100000				
1984	62000	0	0	62000				
1985	62000	0	0	62000				
1986	73000	0	0	73000				
1987	59000	0	0	59000				
1988	56000	0	0	56000				
1989	84000	0	0	84000				
1990	69000	0	0	69000				
1991	63000	0	0	63000				
1992	71000	0	0	71000				
1993	52000	0	0	52000				
1994								
1995								
1996								
1997	50530	0	0	50530				
1998	65987	0	0	65987				
1999	49613	0	0	49613	10098	0	0	10098
2000	42663	0	0	42663	43700	0	0	43700
2001	55107	0	0	55107	44008	0	0	44008
2002	52766	0	0	52766	52381	0	0	52381
2003	62272	0	0	62272	58531	0	0	58531
2004	48946	0	0	48946	44728	0	0	44728
2005	41506	0	0	41506	39950	0	0	39950
2006	32931	0	0	32931				

Table 8: Longline effort in number of traps hauled: **Gough** island

Season	Summary				Logsheet			
Year	Monster	Beehive	Plastic	Total	Monster	Beehive	Plastic	Total
1970	0	0	15400	15400				
1971	0	0	69900	69900				
1972	0	0	43400	43400				
1973	0	0	29500	29500				
1974	10200	0	0	10200				
1975	20600	0	0	20600				
1976	12400	0	0	12400				
1977	16400	0	0	16400				
1978	14300	0	0	14300				
1979	9000	0	0	9000				
1980	17100	0	0	17100				
1981	14300	0	0	14300				
1982	11800	0	0	11800				
1983	17700	0	0	17700				
1984	16300	0	0	16300				
1985	18100	0	0	18100				
1986	16800	0	0	16800				
1987	14900	0	0	14900				
1988	16600	0	0	16600				
1989	27200	0	0	27200				
1990	23300	0	0	23300				
1991	15700	0	0	15700				
1992	24000	0	0	24000				
1993	16800	0	0	16800				
1994								
1995								
1996								
1997	26401	0	0	26401				
1998	34334	0	0	34334				
1999	24466	0	0	24466	6712	0	0	6712
2000	31224	0	0	31224	29969	0	0	29969
2001	43502	0	0	43502	34021	0	0	34021
2002	37542	0	0	37542	36729	0	0	36729
2003	42336	0	0	42336	40528	0	0	40528
2004	26480	0	0	26480	26215	0	0	26215
2005	15063	0	0	15063	15063	0	0	15063
2006	8291	0	0	8291				

Table 9: Nominal longline CPUE in kg per trap hauled: **Gough** island

Season	Summary				Logsheet			
Year	Monster	Beehive	Plastic	Total	Monster	Beehive	Plastic	Total
1970	0.00	0.00	7.99	7.99				
1971	0.00	0.00	5.44	5.44				
1972	0.00	0.00	4.38	4.38				
1973	0.00	0.00	5.46	5.46				
1974	17.84	0.00	0.00	17.84				
1975	13.74	0.00	0.00	13.74				
1976	5.16	0.00	0.00	5.16				
1977	7.93	0.00	0.00	7.93				
1978	7.69	0.00	0.00	7.69				
1979	6.67	0.00	0.00	6.67				
1980	6.20	0.00	0.00	6.20				
1981	8.18	0.00	0.00	8.18				
1982	7.20	0.00	0.00	7.20				
1983	5.65	0.00	0.00	5.65				
1984	3.80	0.00	0.00	3.80				
1985	3.43	0.00	0.00	3.43				
1986	4.35	0.00	0.00	4.35				
1987	3.96	0.00	0.00	3.96				
1988	3.37	0.00	0.00	3.37				
1989	3.09	0.00	0.00	3.09				
1990	2.96	0.00	0.00	2.96				
1991	4.01	0.00	0.00	4.01				
1992	2.96	0.00	0.00	2.96				
1993	3.10	0.00	0.00	3.10				
1994								
1995								
1996								
1997	1.91	0.00	0.00	1.91				
1998	1.92	0.00	0.00	1.92				
1999	2.03	0.00	0.00	2.03	1.51	0.00	0.00	1.51
2000	1.37	0.00	0.00	1.37	1.46	0.00	0.00	1.46
2001	1.27	0.00	0.00	1.27	1.30	0.00	0.00	1.30
2002	1.41	0.00	0.00	1.41	1.43	0.00	0.00	1.43
2003	1.47	0.00	0.00	1.47	1.46	0.00	0.00	1.46
2004	1.85	0.00	0.00	1.85	1.72	0.00	0.00	1.72
2005	2.76	0.00	0.00	2.76	2.65	0.00	0.00	2.65
2006	3.97	0.00	0.00	3.97				